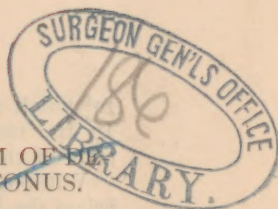


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ANASARCA AS A SYMPTOM OF DEFICIENT VASO-MOTOR TONUS.

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I WISH to invite the attention of the Society to three cases which illustrate a most familiar ailment, but at the same time they have afforded me much food for reflection as to their pathology. I submit them in the hope that some others may be able to shed additional light upon the subject.

The theory which I propose to offer in explanation of these cases may appear to some visionary, but I am sure that reflection will convince the most sceptical that disorder of the vaso-motor nervous system is alone capable of explaining many obscure symptoms otherwise totally unfathomable. We cannot investigate in our patients the state of the circulation by means of the apparatus employed in the physiological laboratory, but on that account it is all the more important to secure all the available collateral evidence on the subject. Cases somewhat similar to my own have been reported, but they are not numerous, and I do not recall any

in which anæmia has not been present. In the cases I shall relate, the opposite state of the blood was unquestionable.

Without further preface, then, let me relate the histories of my cases.

The first, G. W., I saw in June last: he had been working as a watchman on the wharf near South Street bridge. He was a stout, hearty man of one hundred and fifty pounds' weight, with no trace of anæmia, and previously he had enjoyed exceptional health. He had pronounced quotidian intermittent fever, which yielded promptly to cinchonia sulphate. The day after he sent for me, and I found him very dropsical. The anasarca was general, involving face, arms, and legs; there was a small amount of albumen in the urine, but no casts. The heart was acting as usual, though the rapidity of the pulse was accelerated. No murmurs could be heard. The liver and spleen were of normal size, and the man expressed himself as feeling perfectly well except for the swelling.

He was ordered fifteen grains of cinchonia sulphate daily, with  $\mathfrak{z}\text{i}$  ergot fld. ext., t. d. (the ergot was a preparation made by Mr. Wolff, at Twelfth and Chestnut Streets, with glycerin), also tr. iron.

Two weeks and a half afterwards he completely recovered, and has since enjoyed perfect health.

In September I saw another case; this time in the Philadelphia Hospital. In every respect the case was so similar that I could not fail to recall the former. The

same plan of treatment was as effective, though his recovery was retarded till a month had elapsed.

In this case, as convalescence was prolonged, I used the sulphate of zinc, one grain t. d., in addition to the first-named remedies, and stopped the quinine after the third week.

The third case was a colored man raised in Virginia, who had suffered from chills and fever at intervals since 1863. After several of these attacks general anasarca supervened. He told me that he always rubbed himself with an infusion of salt and snake-root, and that in a variable space of time the swelling was, to quote him, "rubbed out."

Just before his admission his malarial fever returned, and following it the dropsy. The anasarca was as extensive as I have ever seen it, even in the worst cases of Bright's disease; the abdominal walls formed tumors from the puffing of the cellular tissue. There was no albumen in the urine; no enlargement of the liver; a moderate increase of the splenic dulness; no heart-disease.

In this case a careful microscopic examination of the blood (Nachet's method) showed only a trifling decrease in the number of the red blood-disks, an average of three examinations showing them to be four million seven hundred and fifty-nine thousand. The urine was rather high-colored, showing by tests an increase in the coloring-matters. There was also a mod-

erate effusion of fluid into both pleural sacs. But, at the same time, the man's spirits were good, and his general health was remarkable. Indeed, he was with difficulty persuaded that he was a sick man.

The treatment here was similar, but purgatives were freely exhibited. Digitalis was employed, and an effort was made to secure some action of the skin by means of hot-water bathing and steam baths. Operative treatment was invoked to relieve the hydrothorax, but no permanent benefit resulted, as the fluid returned, and one day, on rising suddenly from the bed, he fell over dead from asphyxia.

In a post-mortem I have rarely seen so healthy a collection of organs, with the exception of the spleen, which was twice its natural size; but the tissues were fairly reeking with serum, and there was effusion into all the serous sacs.

I would again, at this point, solicit your attention to the fact that these cases occurred in persons who were not anæmic.

Now, in studying these cases for an explanation, two methods have suggested themselves to me. In the first place, when an individual suffers from a chill the blood-vessels of the skin become markedly contracted and the internal blood-vessels as markedly dilated with blood; afterwards we have the febrile and sweating stages, during which the blood-vessels of the skin become dilated and remain so until a new nervous impulse induces contraction, repeating the chill.



Imagine that owing to the intensity and repetition of the action of the malarial poison the normal tonus of the inhibitory nerves is sufficiently impaired to occasion more or less persistent partial or total relaxation of the blood-vessels. The effect of widening the arteries and capillaries would be to over-fill the venous system, and thus would dropsy occur, precisely as in the cases of venous congestion from cardiac disease.

We can, I think, understand that after the malarial germs (?) are destroyed by the action of quinine, the effects of their action upon the nervous system should be more permanent, though the cause has been removed. Familiar illustrations of this are to be found in the enlarged spleen and impaired digestion of those suffering from malaria. This condition passes away whenever the nervous system is recuperated from the shock or the action of nervines assists nature.

In this connection I would remark that the colored patient cured himself with "simples;" in other words, the vaso-motor nerves, having recovered their tonus, resumed their functions. But we are not without experimental evidence on this subject.

The first experiments upon the subject of œdema were made by Lower in 1680. He tied the *venæ cavæ*, and found that œdema appeared in the lower extremities, and he ascribed the œdema to the diminished absorption of the intercellular fluid owing to venous congestion.

Valsalva and others repeated these ex-

periments, but without a similar result. As usual, in the middle ground the truth was found.

Ranvier has proved that œdema depends not only on diminished absorption, but also upon increased exudation from the vessels. He first tied the *venæ cavæ* in the abdomen of a dog, and found, like Valsalva, that œdema did not appear; there was undoubtedly over-filling of the arteries, but the lymphatics were able to absorb the exudation without any assistance from the veins, and therefore no accumulation of fluid took place. He also found that upon cutting the sciatic nerve, on the wounded side, intense œdema occurred.

Venous congestion was undoubtedly present in both legs, as the *venæ cavæ* had been tied, but in one the nervous influence proceeding to the arteries through the sciatic nerve kept them contracted and prevented the exudation of more fluid than the lymphatics could absorb. In the leg in which the nerve had been paralyzed by division of the nerve, the vessels dilated, the limb became rosy and warm, and so much fluid was poured out that the lymphatics alone could not absorb it without the aid of the veins. Ranvier further proved that this was due to the paralysis not of motor but of vaso-motor nerve-fibres which are contained in the sciatic; because, after cutting in different animals motor and vaso-motor nerves in the lumbar region before they had united to form the nerve-trunk, when the motor fibres were

divided as they issue from the lumbar vertebræ before uniting with the sympathetic fibres, complete paralysis of the legs was produced, and no œdema occurred; but if, on the other hand, he divided the sympathetic fibres passing to the sacral plexus, there was no motor paralysis, but the vessels dilated, and œdema occurred. The experiments first cited show us that paralysis of the vaso-motor nerves is an important factor in the production of anasarca. It will also be seen that the œdema in the animals experimented upon is analogous to the accumulation of fluid in the cases of the patients whose histories I have cited. But deficient vascular tonus is not, I think, the only factor involved. Broadly speaking, the waste products of the animal economy are urea, carbonic acid, salts, and water. The carbonic acid and the water pass off by the lungs, the urea, salts, and water by the kidney, but by the skin also small portions of the above substances are eliminated. If the function of the skin is suspended, these substances accumulate in the system, and can, I think, aid in the production of dropsy. In my cases the skin was notably harsh and dry.

Again, the function of the skin is not alone dependent upon the blood-supply of the skin, but is also under the control of the innervation of the nerves supplying the cutaneous glands.

Dr. Foster states that the skin of dogs and cats can be made to act, and sweating produced, by stimulation of the sciatic

nerve after clamping the aorta; and the same result he has obtained in the leg of a frog by stimulating the sciatic nerve after amputating the leg.\* In cases similar to those before us, if exposure to cold occur at the close of a malarial attack, I can understand that the nerves can be influenced by the action of the cold and their function suspended, as easily as I can understand the dilatation of the blood-vessels of the lungs when a pneumonia is traced to a cold. Indeed, I can as readily understand the action of the malarial poison upon the nerves of the spine, just as I can understand the impaired nutrition of those suffering from repeated malarial seizures,—a condition of the system universally credited to an action of the poison upon the nervous system presiding over nutrition. Again, the inaction of the skin may be traced to the anasarca, which diminishes the activity of the circulation of the skin, of course impairing its functional activity. To sum up briefly what I have said, I would refer to the above explanation those cases of general anasarca, often preceded by malaria, in which no lesion of the heart, kidneys, liver, or blood can be diagnosticated. I say blood, because my cases differ from others which I have

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\* The existence of secretory nerves, and their special influence over the secretions of the skin, have also been investigated by Dr. Isaac Ott and G. B. Wood Field in a series of original experiments. Their experiments are confirmatory, and may be found in the *Journal of Physiology* for 1878-79, entitled "Sweat Centres: the Effect of Muscarin and Atropin on them."



seen reported, in the fact that there was no associated anæmia. It appears to me, therefore, that the theory of a lesion of the vaso-motor nerves, and of the nerves presiding over secretion, is more certainly established. The blood-corpuscles, it is true, were counted in but one case, yet I am sure that my hearers will support the statement that anæmia can be recognized by physical examination alone, and the local congestions of anæmia must deceive in but a very few cases. I think the theory which I offer is especially useful in the explanation of those cases of moderate dropsy, which is also very often local, which is frequently seen in persons in middle life, and also in young persons who have been subjected to depression of nerve-tonus.

Before closing, let me ask you to consider a treatment by tonics, directed to restore the tonus of the nervous system, and the vaso-motor system especially,—viz., by strychnia, sulphate of zinc, tincture of chloride of iron, fluid extract of ergot, digitalis, and quinine. These drugs I have successfully employed, sometimes dispensing with the digitalis, especially in the cases of moderate anasarca, and also in cases of those whose stomachs would not tolerate this drug. In the first place, let me say that absorption of fluid from the tissues is, like its exudation into them, probably greatly controlled by the central nervous system. Dr. Brunton cites the experiments of Goltze and Nasse, in

which the former found that when fluid was injected under the skin of the back of a frog it was rapidly absorbed, so long as the brain and spinal cord were unimpaired, but when these were destroyed little or no absorption took place.

Physiologically speaking, absorption is under the influence of nerve-centres, therefore stimulation of these centres will increase their physiological functions. Stimulation of a sensory nerve is capable of inducing contraction of the entire vaso-motor system. Apropos to this, Nasse has found that irritation of a sensory nerve actually did occasion increased absorption. To return, however, to the subject of medication by the drugs mentioned (zinc, ergot, iron, digitalis, strychnia, quinine), not only do they act as tonics to the nervous system, but some of them, viz., those which are astringents, possess a direct influence upon the blood-vessels through their local impression upon the vaso-motor nerves, which fact I quote from Rosenstein's experiments recorded in Ziemssen's "Cyclopædia" and also in Dr. H. C. Wood's "Therapeutics."

Iron may be said to act also by restoring to the red blood-corpuscles one of their normal constituents, enabling them to perform more perfectly their function as carriers of oxygen to the tissues, and thus the material accumulated in the lymphatics and veins is first oxidized and then eliminated from the system.

In my last cases, because the effusion

was so extreme, digitalis was employed. This drug, by its properties as a stimulant to the vaso-motor and cardiac systems, acts most favorably as a tonic diuretic, mainly, probably, through the increased efficiency by which the circulation is maintained. The only contra-indication occurs in cases where the stomach cannot bear the drug; and this remark will also apply to the use of iron.

Finally, let me allude to the value of strychnia as a tonic. This drug is very highly recommended by Dr. Lauder Brunton, to whose paper on the "Action of Tonics" I am much indebted.

He remarks that strychnia by its action as a respiratory stimulant can aid in thoroughly oxygenating the blood, thus promoting the efficiency of the circulation, and by this means also probably the more perfect elaboration of the red blood-cells is accomplished by the blood-making glands.

Further, he claims a stimulant action not only upon the dominant vaso-motor centre, but also upon the vaso-motor centres distributed through the cord. These centres, to quote his words, are so feebly developed as not to heed ordinary stimulation, but can be aroused by the use of strychnia to lend their aid to increase the vascular tonus. "For," says he, "it has been proved that after section of the spinal cord, which of course paralyzes the vaso-motor centre, the blood-pressure can be made to rise by the irritation of a sensory nerve."

But, while giving the prominence to strychnia to which its value as a respiratory stimulant in bronchitis and asthma and its use as a tonic entitles it, I would say that, of the other drugs to which I have referred, none has yielded to my clinical experience more valuable results than the sulphate of zinc. This drug, in small doses continued for a considerable period, is, I think, more efficient than any other preparation of zinc, and it is an addition to our armamentarium with which we can combat nervous exhaustion, scientifically termed deficient vasomotor tonus, whether this deficient tonus is or is not accompanied by oedema.